Intensity Worksheet

#1) $I = \frac{P}{4\pi}$

$300\,cd = \frac{P}{4\pi}$

$\therefore P = (300\,cd)4\pi$

$= 3770\,lm$

$= 4000\,lm$

$E = \frac{I}{d^2}$

$E = \frac{300\,cd}{(5.00m)^2}$

$E = 12\,lx.$

$= 10\,lx.$

#2) $E = \frac{I}{d^2}$

$E = \frac{120\,cd}{(4.00m)^2}$

$\therefore E = 7.5\,lx$

#3) $E = \frac{I}{d^2}$

$50\,lx = \frac{200\,cd}{d^2}$

$\therefore d^2 = \frac{200\,cd}{50\,lx}$

$\therefore d = 2\,m$

#7) a) Point A is closer since more illumination is provided at this point.

b) $E_A d_A^2 = E_B d_B^2$

$\therefore \frac{E_A}{E_B} = \frac{16}{1}$ from the question

$\therefore$ since $\frac{E_A}{E_B} = \frac{d_B^2}{d_A^2}$

then $\frac{d_B^2}{d_A^2} = \frac{16}{1}$

$\therefore \frac{d_B}{d_A} = \frac{4}{1}$ so the ratio is 4:1

c) since $\frac{d_B}{d_A} = \frac{4}{1}$ and $d_A = 20m.$

$\frac{d_B}{20m} = \frac{4}{1}$

$\therefore d_B = 80m$

#9) they should both be the same distance

#10) SAME E, different I's $\therefore \frac{I_1}{d_1^2} = \frac{I_2}{d_2^2}$

$\frac{40\,cd}{(3.00m)^2} = \frac{I_2}{(1.20m)^2}$

$\therefore I_2 = \frac{(40\,cd)(1.20m)^2}{(3.00m)^2} = 6.40\ cd.$

#11) SAME E, different I's $\therefore \frac{I_1}{d_1^2} = \frac{I_2}{d_2^2}$

$\frac{(20\,cd)}{(1.00m)^2} = \frac{I_2}{(2.50m)^2}$

$\therefore I_2 = 125\ cd$

#15) SAME I, different E's. $\therefore E_1 d_1^2 = E_2 d_2^2$

$(144)(1.5m)^2 = (1)(d_2)^2$

$\therefore 324m^2 = d_2^2$

$\therefore d_2 = \sqrt{324} = 18m$

#20) $E_1 = 36.4\ lx$
$d_1 = 95.0m$
$d_2 = 31.0m$
$E_2 = ?$

★ SAME I, different E's $\therefore E_1 d_1^2 = E_2 d_2^2$

$(36.4\,lx)(95.0m)^2 = (E_2)(31.0m)^2$

$\therefore E_2 = 342\ lx.$

#21) SAME E, different I's $\therefore \frac{I_1}{d_1^2} = \frac{I_2}{d_2^2}$

$\frac{15.0\,cd}{(2.50m)^2} = \frac{5.00\,cd}{d_2^2}$

$\therefore d_2^2 = \frac{(5.00\,cd)(2.50m)^2}{15.0\,cd}$

$\therefore d_2 = 1.44\ m.$

#22) SAME I, diffent E's. $\therefore E_1 d_1^2 = E_2 d_2^2$

$(968\,lx)(14.3m)^2 = (322.6\,lx)\,d_2^2$

$\therefore d_2 = \sqrt{613.59\ldots} = 24.8\,m$

#23) same I, diffent E's. $\therefore E_1 d_1^2 = E_2 d_2^2$

$(315\,lx)(2.90m)^2 = (583\,lx)\,d_2^2$

$\therefore d_2 = \sqrt{4.5439\ldots} = 2.13\,m.$

#25) Same I, diffent E's $\therefore E_1 d_1^2 = E_2 d_2^2$

$(480\,lx)(16.4m)^2 = E_2(16.4m \times 4)^2$

$\therefore E_2 = 3.0 \times 10^1\,lx.$

or E_2 should be $\frac{1}{16^{th}}$ of E_1, since Point 2 is 4 times farther than

$\therefore \frac{480\,lx}{16} = 30\,lx. \rightarrow 3.0 \times 10^1\,lx.$

#27) same I, diff. E's. $E_1 d_1^2 = E_2 d_2^2$

$(18.36\,lx)(294m)^2 = (36.72\,lx)\,d^2.$

$\therefore d = 208\,m.$

or $\frac{294m}{\sqrt{2}} = 208m.$